

# Drag & Drop, Mixed-Methodology-based Lab-on-Chip Design Optimization Software, Phase II

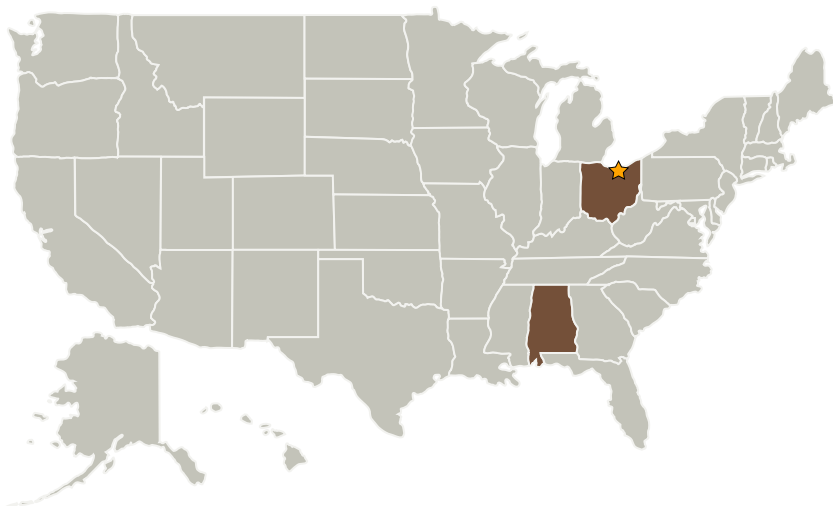
Completed Technology Project (2003 - 2005)



## Project Introduction

The overall objective is to develop a ?mixed-methodology?, drag and drop, component library (fluidic-lego)-based, system design and optimization tool for complex lab-on-a-chip systems. Experiments-based design is expensive and time-consuming. Full multiphysics simulations, while successful in designing components, are computationally infeasible for system design. The proposed tool will accelerate (days to minutes) and simplify (non-expert vs. expert) biomicrofluidic system design. Simple representation of complex, interacting physico-bio-chemical processes is a formidable challenge. Our innovative ?mixed-methodology? solution seamlessly exchanges information between vastly different methodologies, (Artificial Neural Network, Differential Algebraic Equation, Analytical and High-fidelity). In Phase I, we have developed a hierarchical software consisting of System Designer (GUI), System Solver and component models. Proof-of-concept was successfully demonstrated, (compared to high-fidelity simulations), by characterizing a candidate biomicrosystem in a fast (350 fold reduction, 1.5 hour to 15 seconds), intuitive manner, while retaining accuracy (~10% difference). Phase II will feature enhanced component models and system solver for multiphysics phenomena (electrokinetics, biochemistry, capillary and hemodynamics), augmented GUI functionalities and extended library of microfluidic components. An expert advisory board (NASA, academia, industry) will guide the multidisciplinary development team. CFDR is committed to developing simulation tools for biotechnology, and will leverage its considerable expertise and resources toward successful commercialization.

## Primary U.S. Work Locations and Key Partners



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Glenn Research Center (GRC)

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
CFD Research Corporation	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Ohio

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Project Manager:**

Robert Hawersaat

**Principal Investigator:**

S. Krishnamoorthy

## Technology Areas

**Primary:**

- TX14 Thermal Management Systems
  - └ TX14.2 Thermal Control Components and Systems
    - └ TX14.2.5 Thermal Control Analysis